Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM10-24 Room:A01 Time:May 28 16:15-16:45

Advancing Research of Coupling between Geospace Environment and Atmosphere by the EISCAT 3D Incoherent Scatter Radar

TURUNEN, Esa[1*]

[1]SGO, University of Oulu, [2]STEL, Nagoya University

Incoherent scatter (IS) the most advanced radio method to remotely sense the upper atmosphere and the near-Earth space. Since 1981 the EISCAT IS radars in Northern Fennoscandia provide unique measurements from the upper atmosphere in the polar regions, where forcing both by solar activity and lower atmospheric phenomena are present. The facilities are maintained by the EISCAT Scientific Association, an international research organisation registered in Kiruna, Sweden. The mainland EISCAT system consists of high-power VHF (224 MHz) and UHF (930 MHz) radars and the ionospheric modification facility (3.85 - 8 MHz) in Tromso (Norway), as well as radar receiving sites in Kiruna (Sweden) and in Sodankyla (Finland). In addition, the EISCAT Svalbard Radar (ESR) operates at 500 MHz in the polar region.

The new EISCAT 3D phased-array facility, to be built in near future, will be a 3-dimensionally imaging radar, distributed in Norway, Sweden, and Finland. It will surpass all the current IS radars of the world in technology and act as a pathfinder for other types of radar facilities worldwide. EISCAT 3D will make continuous measurements of the geospace environment and its coupling to the Earth's atmosphere in the polar region and at the southern edge of the polar vortex for the next 30 years. Planning of the new IS radar facility started with the EU-funded Design Study (2005-2009). In December 2008, the European Strategy Forum on Research Infrastructures, ESFRI, selected EISCAT 3D to the Roadmap for Large-Scale European Research Infrastructures. The preparation continued in the EU FP7 Preparatory Phase project (2010 - 2014). Currently EISCAT Scientific Association has applied EU financing in order to study together with manufacturers, the industrial implementation of the technical solution for EISCAT_3D. Construction of EISCAT 3D can start as soon as the international financing for EISCAT_3D will be in place.

The EISCAT 3D will be realised as a multi-sited infrastructure using phased-array antennas and a key aspect is the use of advanced software and data processing techniques. The science case of EISCAT 3D includes studies of atmospheric physics and global change, space and plasma physics, solar system research, space weather and other service applications, development of new radar techniques, and methods for coding and analysis. Here we give a summary of the planned characteristics and science goals of the proposed international research infrastructure, review the current status of preparations towards realizing EISCAT 3D, and give a more detailed perspective to one of the key science themes of EISCAT 3D: Coupling between geospace environment and atmosphere of Earth during high energy particle precipitation into the atmosphere.

Keywords: incoherent scatter, geospace environment, atmosphere, dynamic coupling, high-energy particle precipitation, chemistry of atmosphere